Leader's Guide to Risk Management of Heat Casualties

Risk Management is the process of identifying and controlling hazards to protect the force.

Possible Outcomes of inadequate climatic heat management:

Casualty	Risk Severity
Heat Cramps	Marginal
Heat Exhaustion	Critical
Heat Stroke	Critical-Catastrophic
Water Intoxication (Over Hydration)	Critical-Catastrophic

The Five Steps of Risk Management are:

1 Identify Hazards

High heat category, especially on several sequential days (Measure WBGT when ambient temperature is over 75º F)

Exertional level of training, especially on several sequential days

Acclimatization (and other individual risk factors – see table below)

Time (length of heat exposure and recovery time)

(The more factors, the higher the risk)

Individual Risks for Heat Casualties

- **Not acclimatized** to heat (need 10-14 days to get adequately acclimated)
- Exposure to cumulative days (2-3 days) of any of the following
  - Increased heat exposure
  - Increased exertional levels.
  - Lack of quality sleep
- Poor fitness (Unable to run 2 miles in < 16 minutes)
- Overweight
- Minor illness (cold symptoms, sore throat, low grade fever, nausea, vomiting)
- Taking medications (either prescribed or over the counter)/ supplements/ dietary aids Ex: Allergy or cold remedies. Ephedra supplement
- Use of Alcohol in the last 24 hours
- Prior history of heat illness (any heat stroke, or >2 episodes of heat exhaustion)
- Skin disorders such as heat rash and sun burn which prevent effective sweating

2 Assess Hazards

- When ambient temperature is over 75º F, constantly assess the **heat category** using Wet Bulb Globe Temperature (WBGT)
- Know your soldiers! Identify early who will be at increased risk based on **individual risk factors**.
- Check **hydration status** at the end of each training day. Give extra fluid at night and in the morning if hydration is inadequate.
  - Review Riley (water) card or Ogden cords (See Below)
  - Ask about urine color. Urine is clear if well hydrated
- Daily **assess the overall risk** for developing a heat casualty (may use a risk matrix).

Heat Injury Risk Management Matrix

Scores assigned to different conditions based on risk for developing a heat injury.
This scoring system: 0= Low risk; 1=Medium risk, 2=High risk; 3=Extreme risk

RISK FACTORS	Level of Risk (For each Factor Circle the Appropriate Condition)			
	0	**1**	**2**	**3**
Risk Management Worksheet	All control measures implemented			Not all control measures implemented
Heat (WBGT at site)	None (Less than Category 1)	Category 1	Category 2 and 3	Category 4 and 5
No. Sequential Days Heat Cat 5	0	1	2-3	≥4
Any Heat Injuries in the Past Two Days	None	Heat Cramps	Heat Exhaustion	Heat Stroke
Work in Past Two Days (see below)	Easy	Easy or Moderate	Moderate or Hard	Hard
Projected Work for the Present Day	Easy	Easy or Moderate	Moderate or Hard	Hard
Heat Acclimatization Days	>13	7-13	3-6	<3
Leader/Cadre Presence	Full time	Substantial	Minimal	None
Length of Duty Time of Cadre	18 Months	7-18 Months	1-6 Month	< 1 Month
Communication System	Radio and Phone	Phone Only	Radio Only	None
Rest in Previous 24 Hours	> 7 Hours	5-7 Hours	2-4 Hours	< 2 Hours

A cumulative score of 25-33 means Extremely High Risk, 16-24 means High Risk, 7-15 means Medium Risk, and 0-6 means Low Risk.

Easy Work	Moderate Work	Hard Work
• Weapon Maintenance • Walking Hard Surface at 2.5 mph, <30 lb Load • Marksmanship Training • Drill and Ceremony	• Walking Loose Sand at 2.5 mph, no Load • Walking Hard Surface at 3.5 mph, <40lb Load • Calisthenics • Patrolling • Individual Movement Techniques. i.e. low crawl, high crawl	• Walking Hard Surface at 3.5 mph, ≥40 lb Load • Walking Loose Sand at 2.5 mph with Load • Field Assaults

3 Develop Controls

Education

- Establish unit SOP. Ensure all personnel are trained and follow SOPs for Heat Casualty Prevention.
- Ensure all bulletin boards have Heat Casualty Prevention posters and all leaders have Heat Casualty Prevention aids.

Planning

- Adjust the training schedule to minimize consecutive days of heavy physical training, especially if other heat stressors exist (eg. heat exposure and lack of quality sleep)
- Plan communications, medical and evacuation support.
- Plan and provide adequate hydration for *all* personnel (including Cadre and Drill Instructors).
- When planning training events, keep in mind:
  1. Time of day the training is conducted – morning is cooler
  2. Location of training
     - Sun vs. shade. Rest in shade.
     - Open vs. protection from wind - wind has cooling effect
     - Open up the formations to decrease heat strain.
  3. Clothing
     - Heavy, restrictive vs. loose, lightweight
  4. Where in training cycle
     - Most Heat Casualty occur in the 2nd or 3rd week of Recruit training.
     - Acclimatization can take 7-14 days, depending on the physical condition.
     - After moderate to hard work in heat category ≥3; take cold showers at the end of the day.

Identification

- Identify previous heat exhaustion or heat stroke soldiers and mark visibly on uniform (tape).
- Identify overweight soldiers and soldiers who are unfit.
- Identify soldiers on medications and mark visibly on uniform (tape).
- Seriously consider taking soldiers out of training who have had alcohol within the last 24hrs. Seriously consider having ill soldiers seen on sick call.
- Note and document heat category hourly. Position WBGT at site of training

Develop a Hydration Monitoring System

- Examples of monitoring methods:
  - Riley (water) card

WATER CONSUMPTION TABLE

Heat Category	Easy Work	Moderate Work	Hard Work
	Amount to Drink Qt/Hr (one canteen = 1QT)		
1	½	¾	¾
2	½	¾	1
3	¾	¾	1
4	¾	¾	1
5	1	1	1

Do not drink more than 1½ qts per hour or 12 qts per day.
Eat meals! Important for sodium and other electrolytes.

Name:

Time	Mon	Tue	Wed	Thur	Fri	Sat	Sun
0500-0600							
0600-0700							
0700-0800							
0900-1000							
1000-1100							
1100-1200							
1200-1300							
1300-1400							
1400-1500							
1500-1600							
1600-1700							
1700-1800							
1800-1900							
1900-2000							
2000-2100							
2100-2200							

On the back of card: (Battle buddy is to write the amount of water the soldier has drunk).

- Ogden Cord is 550 cord, parachute cord or shoestring that is tied to a uniform buttonhole or ear protection case. Soldiers tie a knot in the cord each time they finish a canteen (1 quart) of water.

3 Develop Controls continued

Know Standardized Guidelines for Warm Weather Training Conditions

Fluid Replacement and Work/Rest Guide

Acclimatized (after approx two weeks training) Wearing BDU, Hot Weather

		Easy Work		Moderate Work		Hard Work	
Heat Category	**WBGT Index, (F°)**	**Work/ Rest**	**Water Intake (Qt/h)**	**Work/ Rest**	**Water Intake (Qt/h)**	**Work/ Rest**	**Water Intake (Qt/h)**
1	78-81.9	NL	½	NL	¾	40/20 min	¾
2 (Green)	82-84.9	NL	½	50/10 min	¾	30/30 min	1
3 (Yellow)	85-87.9	NL	¾	40/20 min	¾	30/30 min	1
4 (Red)	88-89.9	NL	¾	30/30 min	¾	20/40 min	1
5 (Black)	>90	50/10 min	1	20/40 min	1	10/50 min	1

- The work-rest times and fluid replacement volumes will sustain performance and hydration for at least 4 h of work in the specified heat category. Fluid needs can vary based on individual differences (± ¼ qt/h) and exposure to full sun or full shade (±¼ qt/h).
- NL= no limit to work time per hour.
- Rest means minimal physical activity (sitting or standing), accomplished in shade if possible.
- **CAUTION:** Hourly fluid intake should not exceed 1½ quarts.
- Daily fluid intake **should not exceed 12 quarts.**
- If wearing body armor add **5°F** to WBGT in humid climates
- If wearing NBC clothing (mission-oriented protective posture (MOPP 4)), add **10°F** to WBGT index for easy work, and **20°F** to WBGT index for moderate and hard work.

Easy Work = Walking hard surface 2.5 mph <30# load, Weapon maintenance, Marksmanship training
Moderate Work = Patrolling, Walking sand 2.5 mph no load, Calisthenics
Hard Work = Walking sand 2.5 mph w/load, Field assaults

Continuous Work Duration and Fluid Replacement Guide

Acclimatized (after approx two weeks training) Wearing BDU, Hot Weather

It is assumed that soldiers performing these continuous effort tasks have not yet had heat stress or dehydration prior to this activity and will have hours of rest afterwards.

		Easy Work		Moderate Work		Hard Work	
Heat Category	**WBGT Index, (F°)**	**Work (min)**	**Water Intake (Qt/h)**	**Work (min)**	**Water Intake (Qt/h)**	**Work (min)**	**Water Intake (Qt/h)**
1	78-81.9	NL	½	NL	¾	70	1
2 (Green)	82-84.9	NL	½	150	1	65	1 ¼
3 (Yellow)	85-87.9	NL	¾	100	1	55	1 ¼
4 (Red)	88-89.9	NL	¾	80	1 ¼	50	1 ¼
5 (Black)	>90	180	1	70	1 ½	45	1 ½

- NL can sustain work for at least 4 hours in the specified heat category.
- Fluid needs can vary based on individual differences (± ¼ qt/hr) and exposure to full sun or full shade (± ¼ qt/hr).

4 Implement Controls

Decision to accept risk is made at the appropriate level

- Made in accordance with USAREUR Policy Letter 3, AE Pam 385-15 or unit regulation.

Identified controls are in place

- Update WBGT hourly when ambient temperature is ≥ 75˚F.
- Adhere to work/rest cycle in high heat categories. Rest in shade.
- For tasks requiring continuous effort, adhere to guideline and allow extended rest afterwards.
- Training event incorporates good prior planning.

Monitor and enforce hydration standard

- Encourage frequent drinking, but not to exceed **1 ½** quarts per hour or **12** quarts per day. Make water more palatable, if possible, by cooling.
- Do not allow soldiers to empty canteens to lighten load (consider imposing a penalty in timed events).
- Ensure soldiers are well hydrated before training. Ask about urine; urine is clear if well hydrated.
- Check Riley (water) card or Ogden Cord frequently.

Monitor and enforce eating of meals

- Ensure all meals are eaten during the meal break
- Ensure adequate time to eat and drink meals
- Table salt may be added to food when the heat category is high. Salt tablets are *not* recommended

Execute random checks

- Spot checks by first line leaders, Senior NCO's, or Cadre
- Enforce battle buddy checks – need to be aware of each other's eating, drinking and frequency of urination
- Plan placement of leaders to observe and react to heat injuries in dispersed training

Follow clothing recommendations

- Heat category 1-2: no restrictions
- Heat category 3: Unblouse trouser legs, unbuckle web belt
- Heat category 4-5:
  - Unblouse trouser legs, unbuckle web belt
  - Remove t-shirt from under BDU top or remove BDU top down to T-shirt (depending on whether biting insects are present)
  - Remove helmets unless there are specific force protection or safety reasons to keep them on.
- MOPP 4: Add **10°F** to WBGT index for easy work, and **20˚F** to WBGT index for moderate to hard work.

5 Supervise & Evaluate

- Enforce SOP
- Delegate responsibilities to ensure control measures have been implemented
- Monitor adequacy/progress of implementation of control measures
- Conduct spot checks. Do leaders have current WBGT? Are leaders implementing work/rest/drink cycles? Make on-the-spot corrections. Lead by example.
- Conduct spot checks of soldiers. Ask soldiers questions while observing their mental status and physical capabilities. Look out for common signs and symptoms which can rapidly progress to serious signs and symptoms.
- If 1-2 soldiers become heat casualties, stop all training and evaluate each soldier for early signs and symptoms of becoming an impending heat casualty.
- When controls fail, heat injuries occur. The ability to recognize heat injury is paramount. Take immediate action if any heat injuries are observed or suspected. Stop-rest-cool then evaluate in accordance with warning signs and symptoms. If in doubt, evacuate.

Warning Signs and Symptoms of Heat Casualty and Water Intoxication

Indications of possible Heat Casualty

More Common Signs / Symptoms

- Dizziness
- Headache
- Nausea
- Unsteady walk
- Weakness or fatigue
- Muscle cramps

Immediate Actions

- Remove from training/operation
- Allow casualty to rest in shade
- Loosen clothing
- Take sips of water
- While doing the above, call for Medic evaluation of the soldier (Medic will monitor temperature and check for mental confusion)

If no Medic is available call for ambulance or Medevac

Serious Signs / Symptoms

- Hot body, high temperature
- Confusion, agitation (Mental Status Assessment)
- Vomiting
- Involuntary bowel movement
- Convulsions
- Weak or rapid pulse
- Unresponsiveness, coma

Immediately call Medevac or ambulance for emergency transport while doing the following:

- Lay person down in shade with feet elevated until Medevac or ambulance arrives
- Undress as much as possible
- Aggressively apply ice packs or ice sheets
- Pour cold water over casualty and fan.
- Give *sips* of water while awaiting ambulance (if conscious)
- Monitor airway and breathing until ambulance or Medevac arrive

5 Supervise & Evaluate continued

Indications of possible Water Intoxication (Over Hydration)

Signs and Symptoms	What to do:
Confusion Weakness Vomiting	**Ask these questions to the soldier or battle buddy:** 1. Has soldier been eating? Check rucksack for # of MRE's left. 2. Has soldier been drinking a lot? (suspect water intoxication if soldier has been drinking constantly). 3. How often has soldier urinated? (frequent urination seen with water intoxication; infrequent urination with heat illness) 4. What color is urine (clear urine may indicate over hydration) If soldier has been eating, drinking and urinating a lot, yet has these symptoms, **immediately call Medevac or ambulance for emergency transport**

Mental Status Assessment

An important sign that the soldier is in a serious life-threatening condition is the presence of mental confusion (with or without increased temperature). Anyone can do a mental status assessment asking some simple questions.

Call for emergency Medevac or ambulance if *any* of the following exist:

What is your name?
(Does not know their name.)

What month is it? What year is it?
(Does not know the month or year.)

Where are we/you?
(Does not know the place where they are at.)

What were you doing before you became ill?
(Does not know the events that led to the present situation.)

Hot Weather Casualties and Injuries Chart

- Train commanders and soldiers on heat injury prevention and heat risk assessment
- Remember the acronym **H**-**E**-**A**-**T** when training in hot weather (**H**: heat category; **E**: exertion level; **A**: acclimatization; **T**: time of heat exposure and recovery time)
- Follow recommended fluid replacement guidelines and ensure nutritional requirements are met

Hot Weather Injuries and Casualties

Cause	Symptoms	First-Aid	Prevention
Sunburn			
• Exposure of skin to direct sun • Can occur on overcast days	• Red, hot skin • May blister • Moderate to severe pain • Can result in fever	• Move to shade; loosen clothing if necessary • Apply cold compress or immerse in cool water • Apply moisturizing lotion to affected areas • Hydrate with fluids • Administer analgesics for pain or fever • Do not break blisters	• Adequate sun protection • Use sunscreen liberally and apply often, especially when sweating excessively • Select SPF 15 or higher • Proper wear of clothing, cap
Heat Rash (Prickly Heat)			
• Restrictive clothing • Excessive sweating • Inadequate hygiene • Causes heat intolerance if 20% of skin affected	• Red, itchy skin • Bumpy skin due to blocked pores • Moderate to severe itching • Can result in infection	• Apply cold compress or immerse in cool water • Keep area affected dry • Control itching and infection with prescribed medications	• Proper wear of clothing • Shower (nude) after excessive sweating
Heat Cramps			
• Excessive loss of salt from body due to excessive sweating • Not acclimatized to hot weather	• Painful skeletal muscle cramps or spasms • Mostly affects legs and arms	• Replace salts • Sit quietly in the shade or cool area • Massage affected muscle • Drink oral rehydration package or sports drink • Drink 0.05 to 0.1% salt solution (add ¼ of MRE salt packet to 1 quart canteen) • Get medical evaluation if cramps persist	• Eat all meals to replace salt • Consume salt-supplemented beverages if adequate meals have not been consumed prior to prolonged periods of heavy sweating • Ensure adequate heat acclimatization
Heat Exhaustion			
• Body fatigue and strain on heart due to overwhelming heat stress • Dehydration (see below) • Inadequate acclimatization • Inadequate physical fitness for the work task • Most common exertional heat illness	• Dizziness • Fatigue • Weakness • Headache, nausea • Unsteady walk • Rapid pulse • Shortness of breath	• Initiate active cooling by best means available. • Move to shade and loosen clothing • Lay flat and elevate feet • Spray/pour water on soldier and fan for cooling effect or use ice sheets around neck, arm pits and groin, if available • Monitor with the same (one) instructor or supervisor • Assess soldier's mental status every few minutes • Have soldier slowly drink one full canteen (quart) of cool water every 30 minutes with a maximum of 2 canteens • If not improved in 30 to 60 minutes, evacuate for further medical care • NOTE: Those who recover within 60 minutes should return to light duty on a profile for the remainder of the day	• Allow for acclimatization • Monitor WBGT • Keep soldiers in shade whenever possible • Follow water replacement guides • Observe work-rest cycles • Identify high risk individuals • Maintain buddy system • Eat all meals in garrison and field • Do not take dietary supplements • Modify uniform accordingly • Teach early recognition of symptoms • Recognize cumulative effect of sequential hot days • Reevaluate training mission if several mild heat injuries occur
Heat Stroke			
• Prolonged exposure to high temperatures • Cumulative heat stress due to repetitive activity in hot environment • Failure of body's cooling mechanisms • Prolonged and overwhelming heat stress • Predisposing factors such as sickness, poor health or certain medications	• Any of above symptoms, but more severe • Nausea, vomiting • Altered mental status with agitation, confusion, delirium, disorientation • Elevated temperature, usually above 104˚ F • Can progress to loss of consciousness, coma, and seizures	• This is a **medical emergency** and can lead to death! **Evacuate** soldier to a medical facility immediately! • **Begin cooling aggressively**. Body temperature that does not go below 100˚ F with active cooling or ANY mental status changes calls for immediate evacuation. • Initiate measures for heat exhaustion • Apply ice packs or iced sheets • Assess soldier's mental status every few minutes • If conscious, give sips of cool water while waiting for evacuation or ambulance • Do not give water to unconscious soldier • If possible, measure body temperature • Monitor airway and breathing • If medic or CLS is present, start intravenous (IV) fluids but limit to 500 ml NS or LR • Continue cooling process during transport (until body temperature reaches 100˚ F	• Follow measures for heat exhaustion • Plan medical support for heat intensive operations • Ensure appropriate Evacuation capabilities available • Ensure Preventive Medicine personnel and measures are in place

Additional Medical Considerations in the Hot Weather Environment:

Dehydration			
• Depletion of body fluids and possibly salt	• Dizziness • Weakness and fatigue • Rapid pulse	• Replace lost water and salt • Water should be sipped, not gulped • Get medical treatment	• Drink 3-6 quarts of fluid per day • Follow fluid replacement guidelines • Consume full meals and drink at mealtime • Do not take dietary supplements
Over Hydration (Hyponatremia)			
• Over hydration or water intoxication • Decreased meals or dieting • Loss of body salt	• Confusion • Weakness • Nausea, vomiting	• Replace salt loss • Follow measures for heat exhaustion • If symptoms persist or become more severe with rehydration, immediate evacuation	• Follow fluid replacement guidelines • Replace lost salt by consuming meals and sports drinks, as directed. • Provide snacks or carbohydrate electrolyte